Electroweak Model, QCD and Cross Sections

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PDG Advisory Meeting

LBNL, November 14, 2004

- Electroweak Model and Constraints on New Physics – J. Erler(U. Mexico) and P. Langacker (U. Penn)
- Quantum Chromodynamics – I. Hinchliffe (LBNL)
- Cross-Section Formula for Specific Processes – R. Cahn (LBNL)

Overseers:

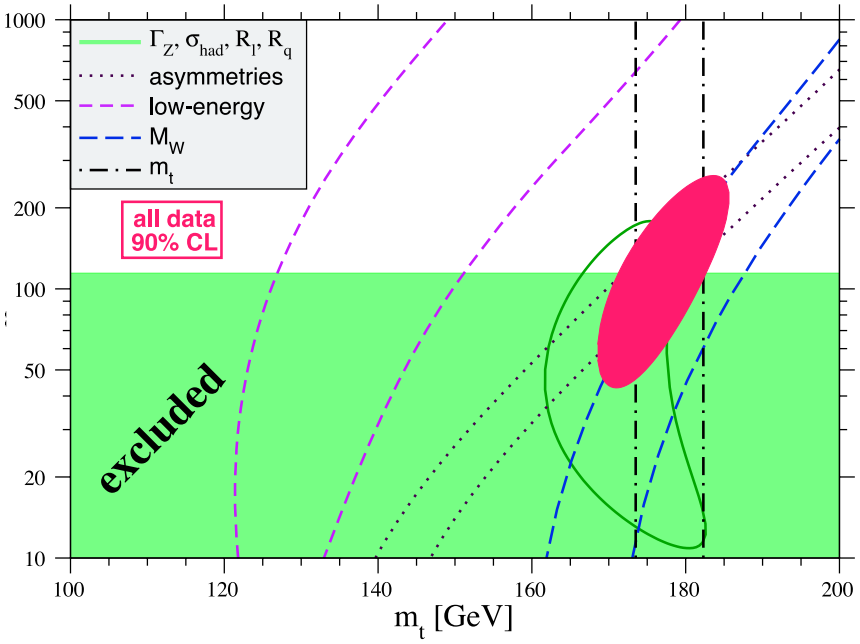
M. Barnett and W. Yao

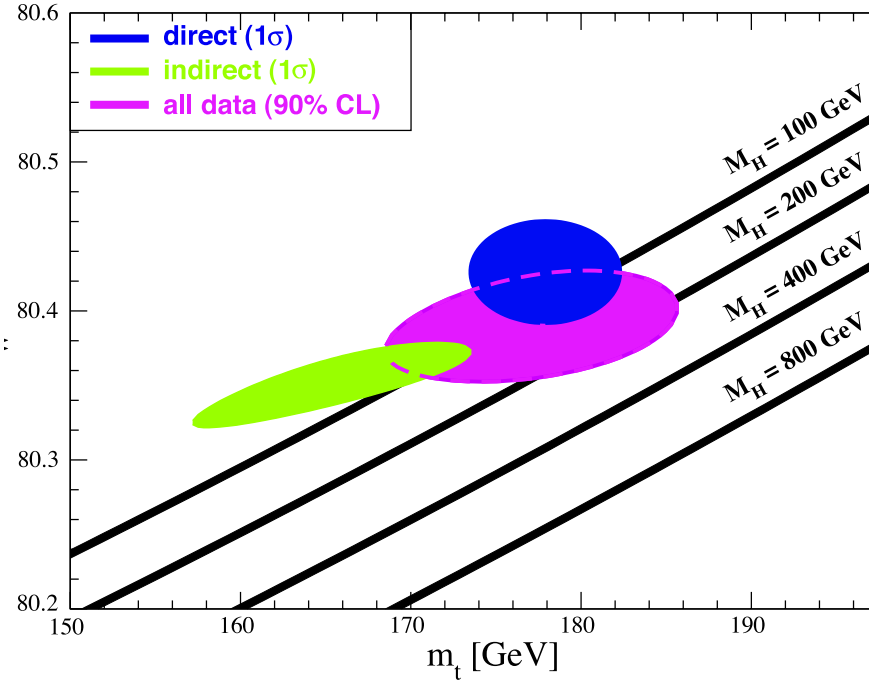
Electroweak Model and Constrains on New Physics

Outline:

- Introduction
- Renormalization and radiative corrections
- Cross-section and asymmetry formulas
- W and Z decays
- Experimental results
- Constrains on new physics

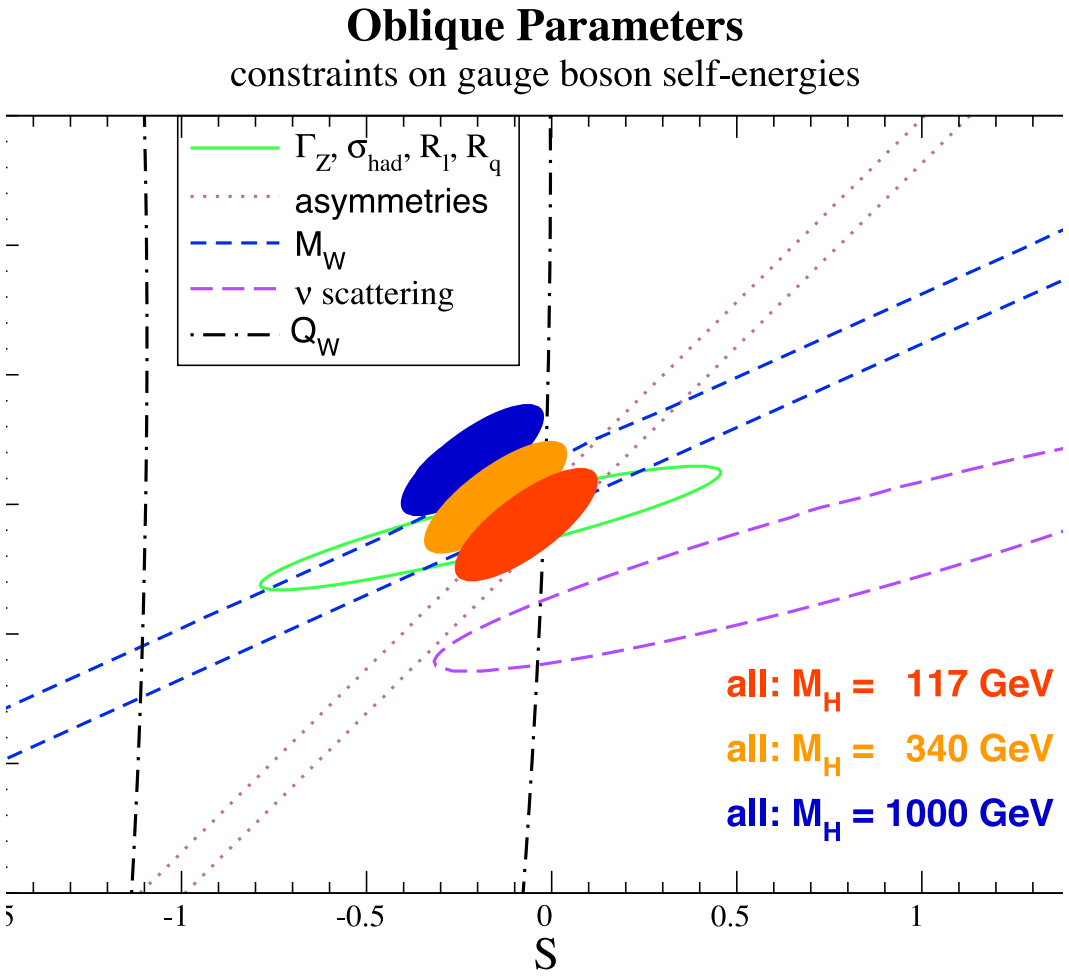
Constrains on the Higgs Mass





- $M_H = 113^{+56}_{-40}$ GeV/c^2
- $M_H \leq 241$ GeV/c^2 at 95% C.L.

Constrains on New Physics



- 1 σ constrains on S and T from various inputs.

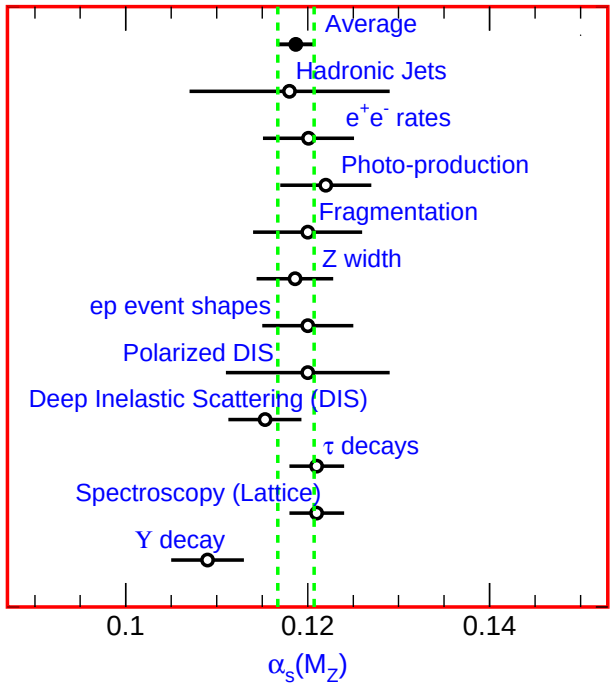
- One of the best motivated kinds of physics beyond the SM besides Supersymmetry are extra Z' bosons.

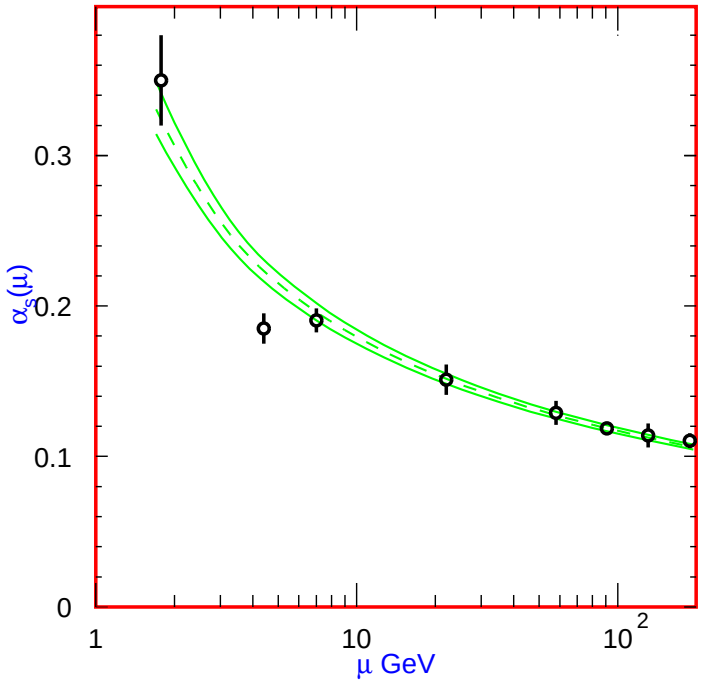
Quantum Chromodynamics

Outline:

- The QCD coupling and renormalization scheme
- QCD in deep-inelastic scattering
- QCD in decays of the τ lepton
- QCD in high-energy hadron collisions
- QCD in heavy-quarkonium decay
- Perturbative QCD in e^+e^- collisions
- Scaling violation in fragmentation functions
- Photon structure functions
- Jet rates in ep collisions
- QCD in diffractive events
- Lattice QCD

Summary of α_s





- $\alpha_s(M_Z) = 0.1187 \pm 0.002$
- Clearly shows the experimental evidence for α_s running

Cross-Section Formula for Specific Processes

- Current Version:
  - e^+e^- annihilation
  - Two-photon process at e^+e^- colliders
  - Inclusive hadronic reactions
  - One-particle inclusive distributions

- Need of a major updates as suggested by last PDG advisory meeting to include more modern processes.

- We have not got the chance to update in 2004, but will do for 2006 edition